

08/13/98  
1556 U.S. PTO

1205 North Kings Highway  
Cherry Hill, NJ 08034  
609-429-4100  
August 13, 1998

In re: Patent Application of  
ERIC CLEVER ET AL.  
Our File No. 5012-2

MAILED ON August 13, 1998  
**BY EXPRESS MAIL**  
NO. EE354882491 US

Box Patent Application  
Assistant Commissioner for Patents  
Washington, DC 20231

Sir:

On behalf of the Applicants, we are pleased to present herewith application for Letters Patent entitled "Hermaphroditic (Genderless) Construction System" comprising the specification, claims, declaration, petition and power of attorney and one copy of four sheets of informal drawings. Also enclosed is an original executed verified statement claiming small entity status.

Respectfully submitted,

  
NORMAN E. LEHRER  
Registration No. 26,561

## **HERMAPHRODITIC (GENDERLESS) CONSTRUCTION SYSTEM**

### **CROSS REFERENCE TO RELATED APPLICATION**

This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/055,282, filed August 13, 1997.

### **BACKGROUND OF THE INVENTION**

This invention relates to construction toy systems. More particularly it relates to both hub and rod construction toy systems based on hermaphroditic and identical (genderless) connectors, and to building block systems also based on genderless connectors. In many cases the genderless connectors are integral to the parts being connected. These genderless connectors greatly extend the range of applications for this invention. In particular we disclose improvements to such construction systems that greatly facilitate connection perpendicular to the usual plane of connection for such systems. Said improvements can be characterized as female connectors that accommodate said genderless connectors – effectively converting them to male connectors.

This is a crowded art with much activity in the construction toy system part of it, with many U.S. patents, referred to by number below, known to the inventor which have some pertinence. U.S. Pat. No. 1,113,371 discloses the original rod and hub construction toy system with wooden hubs and rods and with the rod inserted into a hole in the hub and held there by friction and compression (interference fit). U.S. Pat. No. 1,707,691 discloses a hub and rod construction toy system with a hub of stamped metal and wooden rods with slit ends. The connection is formed by inserting the metal hub into the rod-end slit. A great many construction toy systems allow identical elements to be

interconnected but with only a few exceptions noted below the actual connections are not genderless. Instead, the male and female connecting elements are placed on opposite ends of the block or hub. In any event, we found no construction system that allowed genderless connection between non-identical elements, e.g., between hub and rod. U.S. Pat. No. 3,626,632 discloses a typical building block system that allows identical blocks to be interconnected by means of a male element on one side and female elements on three other sides. But U.S. Pat. No. 2,800,743 discloses a nearly genderless building block system. But in this system when genderless connections are made the elements are no longer aligned and regular figures can not be constructed.

U.S. Pat. No. 2,633,662 discloses a construction toy system with genderless interconnection for hubs connected orthogonally. But hub and rod connections in the same plane are effected with rods that connect across the face of the hubs and do not form a genderless connection. U.S. Pat. No. 4,758,196 discloses a hub and rod construction toy system with genderless rod-rod connections but without any way of directly connecting the hubs.

Various concepts from the construction and other industries have been adapted to construction toy systems. U.S. Pat. No. 3,648,404 discloses a hub and rod construction system designed to be used with hollow rods. The construction toy system disclosed in U.S. Pat. Nos. 4,078,328 and 5,049,105 uses a similar connection system. U.S. Pat. No. 3,891,335 discloses a hub and rod and panel snap together construction system. The hub and rod construction toy system disclosed in U.S. Patents 5,061,219, 5,137,486 and 5,199,919 uses a retaining clip similar to the one disclosed in the 335 patent. The 486 patent does disclose a genderless hub-hub connection for orthogonally connecting hubs. However, the means of connecting the hubs is not the same means as connecting rods to hubs.

Other mechanical connectors include Patent 4,280,339, which discloses a torque transfer device for flexible shaft couplings. Each shaft has an extended portion with forked ends defining teeth. The teeth are inserted orthogonally to each other. U.S. Pat. No. 3,800,556 discloses a power shaft coupling including a coupling mechanism

having elongate square bars defining extensions. These extensions may be mutually inserted in orthogonal positional relationship. Patent 2,577,508 is a universal coupling with bifurcated tongues that mate. Patent 2,832,943 is a detachable coupling in which the male and female members are not identical but do have an orthogonal insert relationship. U.S. Pat. No. 3,224,222 is a universal joint with yoke members including cross-pintles for connecting the yoke members together.

Hermaphroditic connectors have been used in the electronic connector industry. The invention disclosed herein grew out of our prior electronic connector inventions. See Clever and Lyons U.S. Pat. No. 5,183,409 and continuation in part application 08/01/1994.

Other presently known U.S. Patents having interest are: 3,516,043; 3,070,769; 2,690,542; 3,011,143; 4,199,208; 3,634,811; 2,996,026; 3,070,769; 2,475,046; 2,470,282; 1,865,300; 2,577,508; 607,607; 3,552,145; 1,171,380; 2,740,271; 4,172,369; 2,460,231; 534,732, and 2,389,115. It is believed that the present invention is patentably distinct from the teachings of any of the above-cited patents.

## **SUMMARY OF THE INVENTION**

We disclose improvements to the construction toy systems disclosed in our copending related Application Serial No. 08/862,948 filed May 30, 1997 which describes toy systems all of whose parts directly interconnect by means of genderless connectors, The entire subject matter of said prior application being incorporated herein by reference. The improvements include: the use of the genderless connectors as either male or female connectors, a female connector that can be used with the genderless connectors, chamfered fingers to improve the ease of connection.

By the use of these genderless connectors plus the disclosed improvements a very wide range of very different and independent toy systems can be designed that freely inter-connect. In fact, the invention disclosed in the related application with the addition of the improvements disclosed in this application allows for the creation of a near universal construction toy system - one that allows for free inter-connection across a

wide range of construction toy types: hub-and-rod, beam-and-beam, blocks, and geodesics all in a range of sizes that makes them appropriate for various age groups from toddler (very large and easy to grasp) to adult (miniature, precision) with all the pieces from all the sizes and types interconnecting.

## **BRIEF DESCRIPTION OF THE FIGURES**

For the purpose of illustrating the invention, there are shown in the accompanying drawings forms which are presently preferred; it being understood that the invention is not intended to be limited to the precise arrangements and instrumentalities shown.

FIG 1 shows in perspective view a rod and hub assembly that uses the female vertical connector.

FIG 2 shows in plan view a hub with two forms of the female vertical connector - type 2 and type 3 connectors - type 1 is the basic type genderless.

FIG 3 shows in perspective view a hub with another form of the female vertical connector - type 4.

FIG 4a shows a bottom perspective view of an elongated connector - type 6 - that is part of an adapter block.

FIG 4b shows a top perspective view of an elongated connector - type 6 - that is part of an adapter block.

FIG 5 shows in plan view a hub with another form of the vertical female connector - type 5.

## **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Disclosed are improvements to the inventions disclosed in the related application. The disclosures include chamfered or filleted entries on the basic type 1 genderless connectors to improve ease of assembly of the hubs and rods. Also disclosed are 'vertical' connectors that are female connectors that mate with genderless type 1

connectors and allow for connection of rods to hubs or of rods to blocks that would not otherwise be available. As in the basic type connector these other connectors - types 2 through 6 - rely on a slight interference fit to hold (as is disclosed in the related application). Also disclosed is an 'adapter block' that allows rods of genderless construction systems to mate with traditional block systems. These block systems rely on an interference fit between vertically extruded bosses. We adapt the 'down bosses' in our adapter block with a vertical female type 6 connector.

Said vertical connectors are the negative of type 1 genderless connectors. Which is to say that they can be modeled by Boolean operations on solids by subtracting a type 1 connector from a solid. If only the slot end of the type 1 connector is used for the subtraction then connectors of type 3 and type 4 are produced. If the web end is used for the subtraction then type 2, type 5 and type 6 connectors are produced.

In an optimally designed vertical female connector the surfaces of connection to a type 1 connector are the x-bearing surfaces. However, vertical female connectors type 4 and type 6 must also use the web-bearing surface of the finger not inserted as a surface of connection. These types are used when space is limited and there is not enough room for both halves of a vertical female connector.

The chamfer or filleted entries on the type 1 connectors ease the angle of entry from 90°.

## **DETAILED DESCRIPTION OF THE DRAWINGS**

We disclose inventions that aid in the construction of complex hub, rod, and block assemblies in which rods are inserted perpendicular to the major plane of said hubs and blocks. These inventions are improvements to hub, rod and block construction systems in which the major plane of connection is parallel to the major plane of the part. In FIG. 1 we show an assembly 11 of six rods, all effectively identical to rod 12, and three hubs, all effectively identical to hub 13. Connection is effected by means of type 1 connectors on rods, all effectively identical to connector 14a on rod 12, and by type 4 connectors on hubs, all effectively identical to connector 15a in FIG. 1 and 15b..c in FIG.

3. (Note that connector 14b on hub 13 is functionally identical to connector 14a.). FIG. 3 shows a hub 31 identical in function to hub 13 where it is shown in near plan view for clarity.

Connection is achieved when a rod's type 1 connector is inserted into a type 4 connector, such as 15b, in such a way that its x-bearing surfaces 16a and 16b on its finger 17a slide past x-bearing surfaces 32a and 32b and its web-bearing surface 18b on finger 17b slides past web-bearing surface 33. Note that it is neither necessary nor usually desirable for a rod finger back surface 19 to contact a vertical female back surface 34.

In FIG. 2 we show in plan view a hub 21 with vertical female connectors distributed in a polar array with their principal axis perpendicular to the hub's main axis. These vertical female connectors consist of type 2 connectors all identical to 22, and type 3 connectors all identical to 23. Said connector 23 is constructed of two identical halves 24a and 24b. The separation between the two halves effectively creates a web 25 which acts as a stop to the insertion of a type 1 connector which cannot be inserted past its own web 10. On the other hand, type 2 connector 22 lacks such an obstruction and a rod with the same profile 25 can pass all the way through with only the interference fit of the x-bearing surfaces 26 resisting its passage.

Also are shown eight type 1 connectors all identical to connector 27 with chamfered or filleted entries 28 and backfills 29. When inserting a rod, web faces 71 and 72 touch before the chamfer tip 28 touches the backfill 29.

In FIG. 5 a hub 51 is furnished with type 5 connectors all identical to 52. Said connectors lack web and web faces. Interference fit is achieved at x-bearing surfaces 53a and 53b and abbreviated x-bearing surfaces 54a and 54b.

In FIG. 4b we show an adapter block with vertically extruded hollow bosses 41 on the top. The block is a hollow rectangle open at the bottom.

In FIG. 4a we show a hollow rectangle adapter block 40 open at the bottom. When one block is placed on top of another, said top bosses 41 mate, by means

of an interference fit, with vertically extruded hollow down bosses 42 placed in block 40's hollow bottom 43. Vertical female connectors identical to 44 are placed within down bosses 42. Said connectors 44 consist of two hollow fingers 45a and 45b attached to the wall 46 of said connector. Said fingers 45a and 45b can optionally be filled at the top and furnished with chamfered tips 47a and 47b. Connection is achieved to a rod furnished with type 1 connectors by means of an interference fit at x-bearing connecting surfaces 48a..d when said rod is inserted and its x-bearing surfaces slide past 48a..d with an interference fit.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and accordingly, reference should be made to the appended claims rather than to the foregoing specification as indicating the scope of the invention.

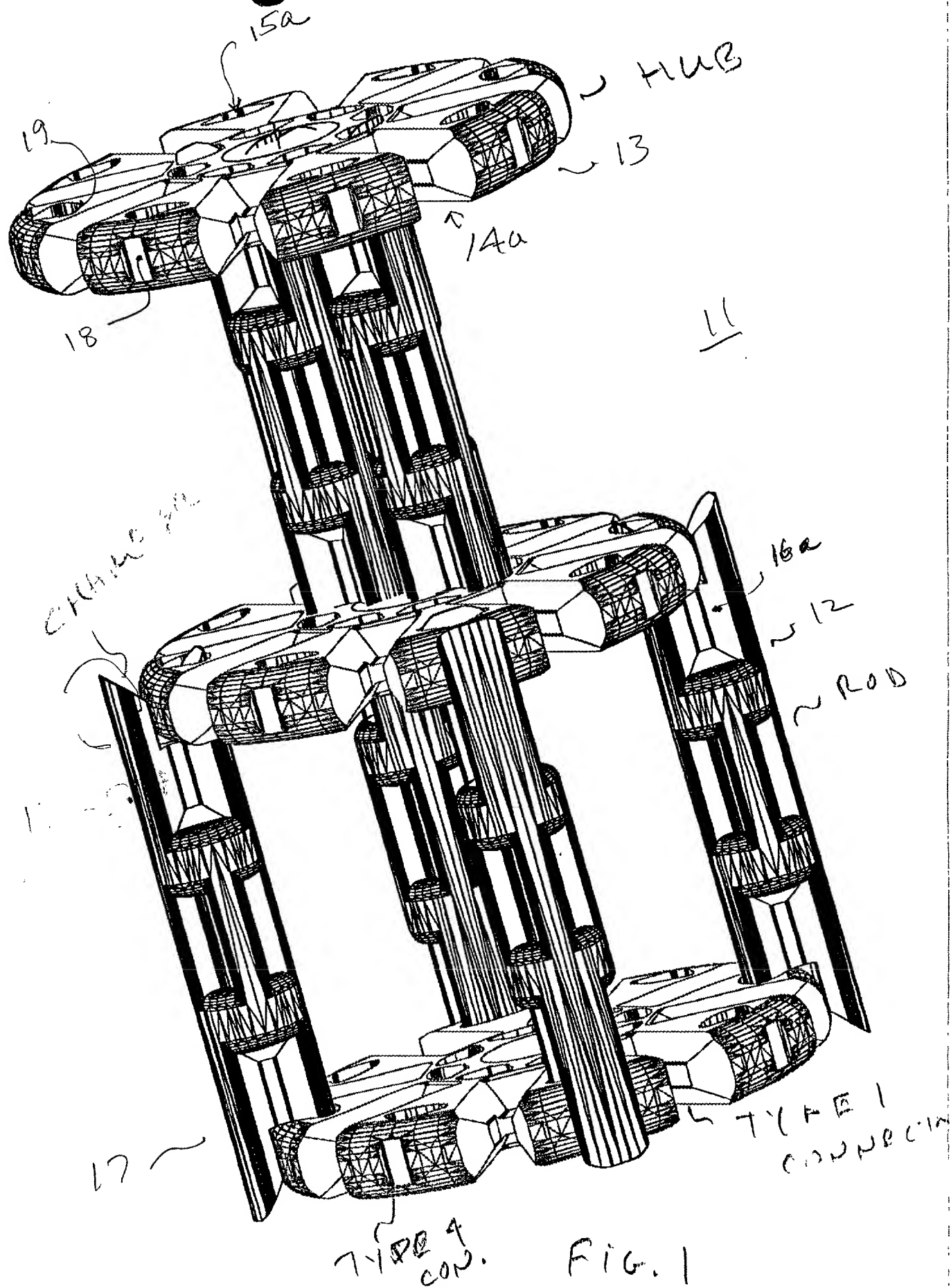


We claim:

1. Female connectors for use with a genderless construction system wherein said female connector is comprised of two holes adapted to mate with a two-fingered genderless connector by means of an interference fit when the fingers are inserted into the holes.
2. The female connector as claimed in Claim 1 in which the holes are not distinct from each other.
3. A hollow block for use with a genderless construction system, said block including a top and a hollow bottom and including a plurality of bosses formed on said top and in said hollow bottom such that when said blocks are placed on top of each other they connect to each other, said bottom bosses being furnished with connectors that allow rods or similar devices to be connected by means of said connectors.

### **ABSTRACT OF THE DISCLOSURE**

Disclosed are improvements to a construction system based on genderless connectors. The improvements consist of chamfered entries to permit greater ease of connection and a suite of female connectors that extend the capabilities of the basic genderless connectors on which the construction system is based.

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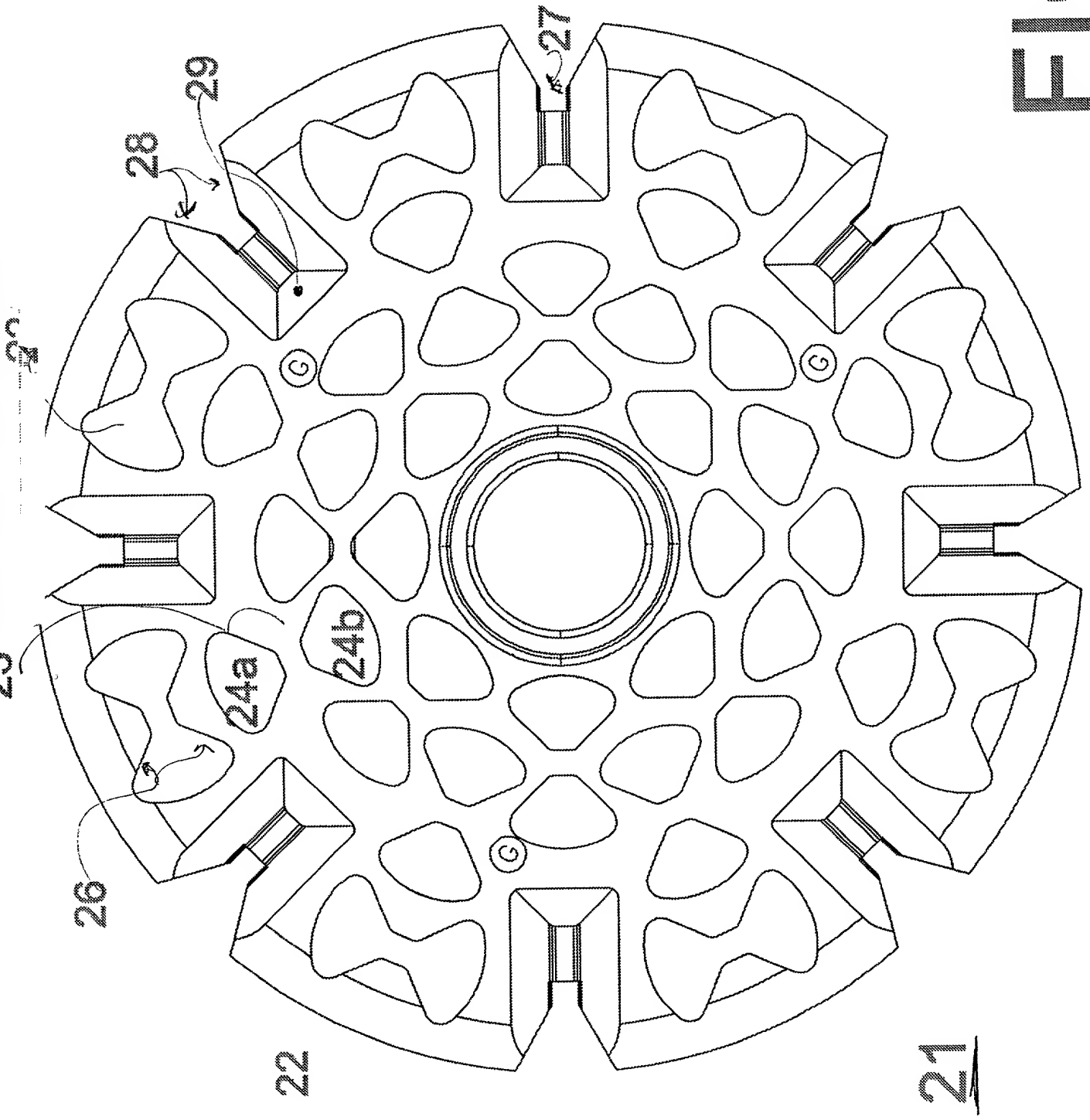


FIG. 2

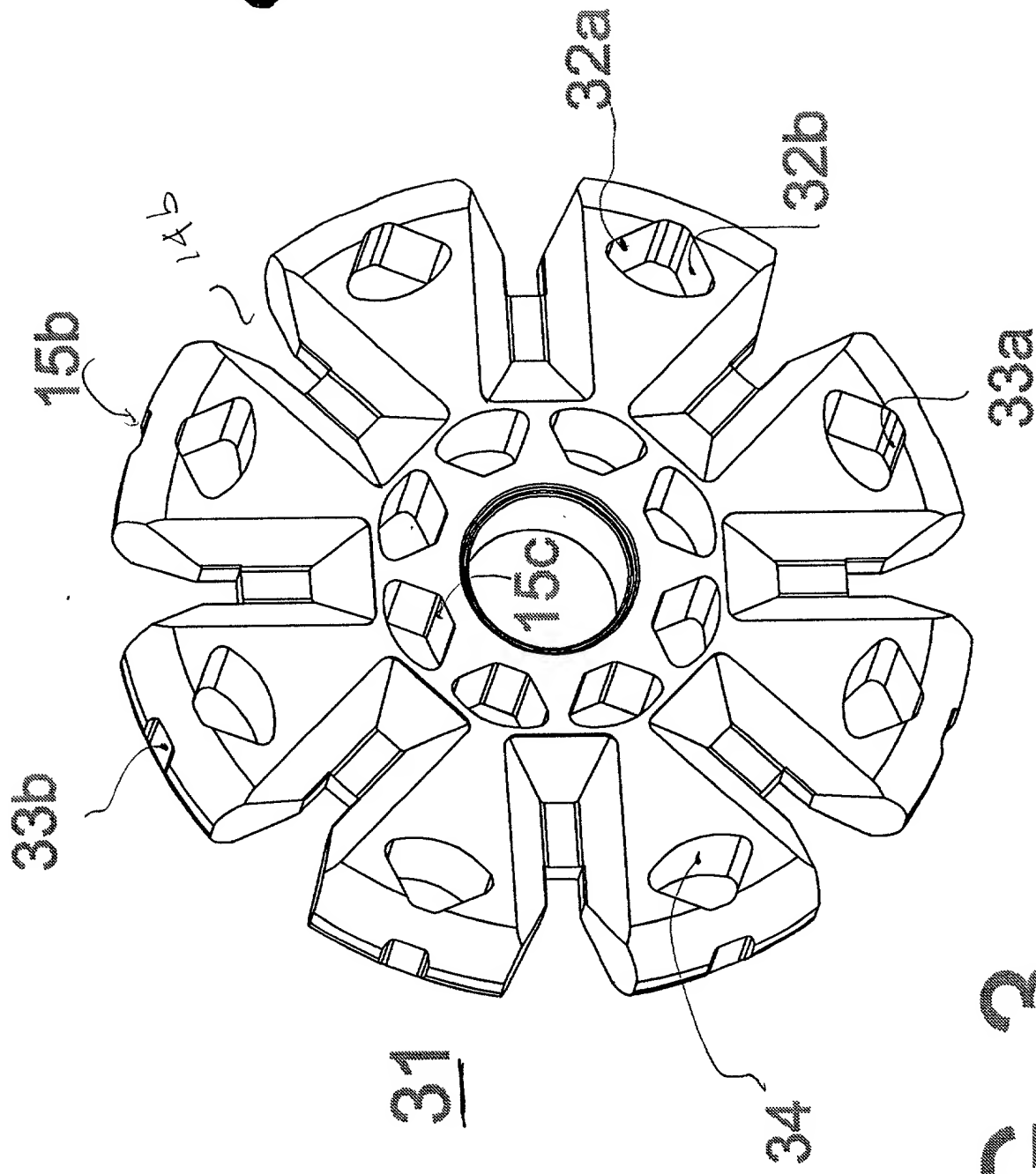
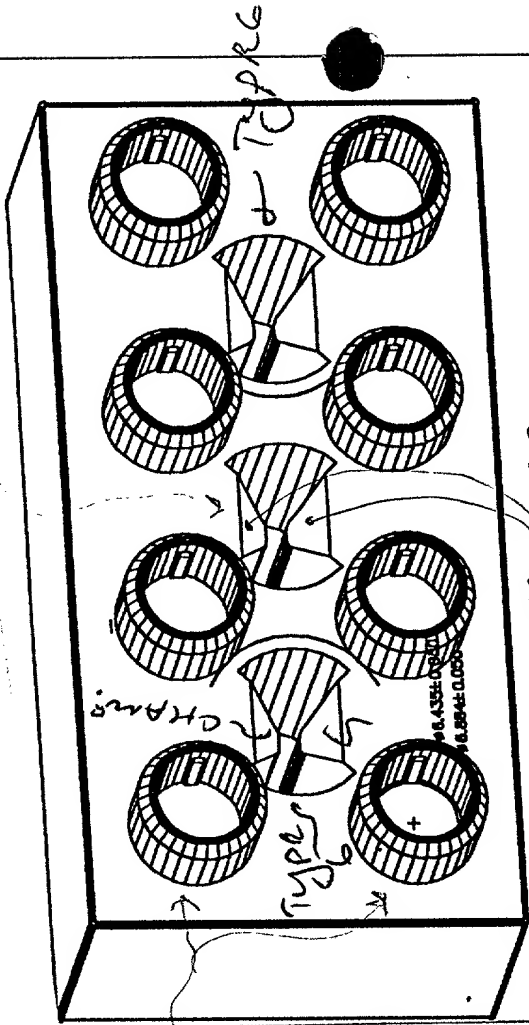
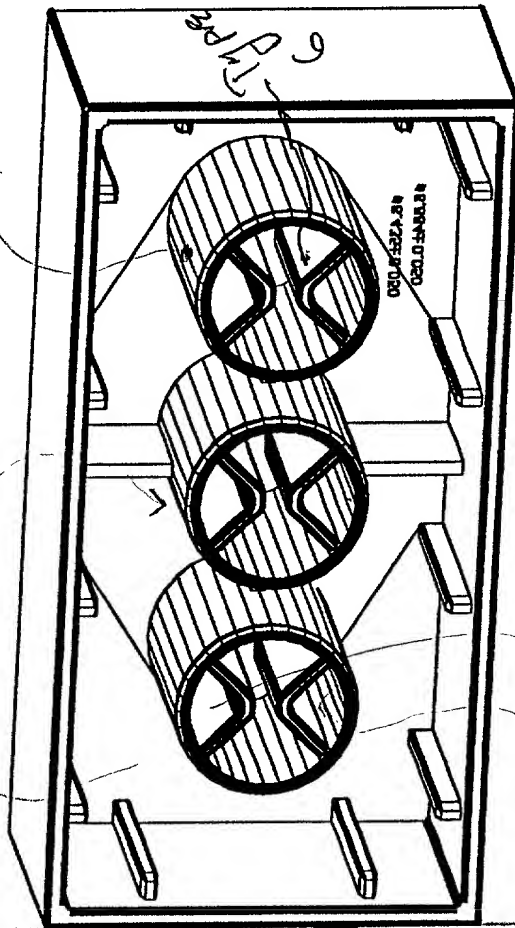


FIG. 3

EW 44



A10 40  
A2 41b  
A6



Bot. view

Fig 4a

45a

45b

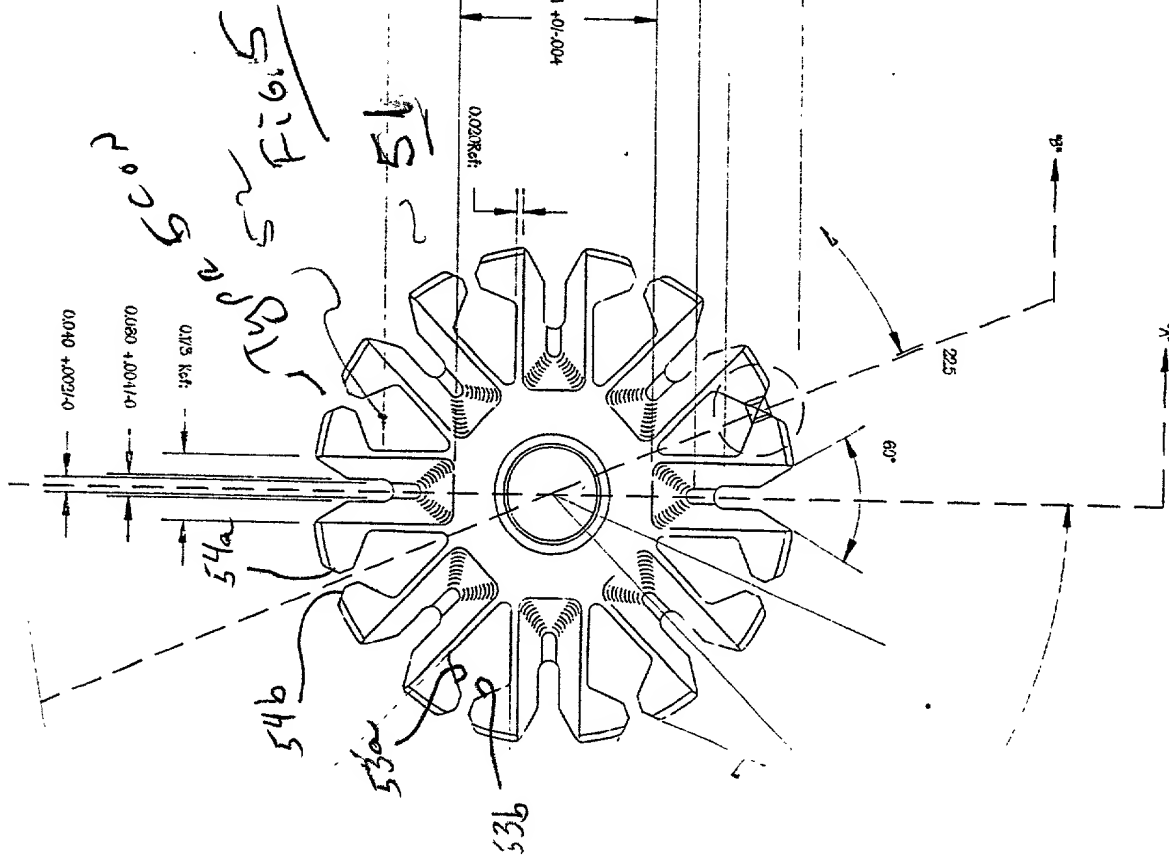


FIG 5

0.0040 ± 0.0021-0

0.0080 ± 0.0011-0

0.075 Ref.

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54b

53a

53b

53c

53d

53e

53f

53g

53h

53i

53j

53k

53l

53m

53n

53o

53p

53q

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DECLARATION

We, Eric Clever and Ray Lyons, hereby declare that:

We are citizens of the United States, residing in Haddonfield, New Jersey, and Parkland, Pennsylvania, respectively, and having a post office address of 29 Estaugh Avenue, Haddonfield, New Jersey 08033.

We believe we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled "Hermaphroditic (Genderless) Construction System" the specification of which is attached hereto.

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

We have not previously filed any foreign applications for patent or inventor's certificate.

We hereby claim the benefit under 35 U.S.C. §119(e) of Provisional Application Serial No. 60/055,282, filed August 13, 1997.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY

We hereby appoint Norman E. Lehrer, Registration No. 26,561, Vanitha M. Elgart, Registration No. 41,445, and Franklyn Schoenberg, Registration No. 22,208, whose address is 1205 North Kings Highway, Cherry Hill, New Jersey 08034, and whose telephone number is 609-429-4100, as our attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

PETITION

Wherefore we pray that Letters Patent be granted to us for the invention or discovery described and claimed in the foregoing specification and claims, and we hereby subscribe our names to the foregoing specification and claims, declaration, power of attorney and this petition.

Dated: \_\_\_\_\_

\_\_\_\_\_  
ERIC CLEVER

Dated: \_\_\_\_\_

\_\_\_\_\_  
RAY LYONS

Applicant or Patentee: Eric Clever et al. Attorney's  
Serial or Patent No.: \_\_\_\_\_ Docket No.: 5012-2  
Filed or Issued: \_\_\_\_\_  
For: Hermaphroditic (Genderless) Construction System

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9 (f) and 1.27 (b)) — INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9 (c) for purposes of paying reduced fees under section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled "Hermaphroditic (Genderless) Construction System" described in

☒ the specification filed herewith  
☐ application serial no. \_\_\_\_\_, filed \_\_\_\_\_  
☐ patent no. \_\_\_\_\_, issued \_\_\_\_\_

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9 (c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9 (d) or a nonprofit organization under 37 CFR 1.9 (e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

☒ no such person, concern, or organization  
☐ persons, concerns or organizations listed below\*

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

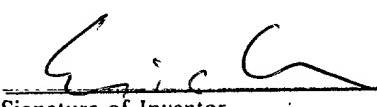
FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

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☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28 (b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

ERIC CLEVER  
NAME OF INVENTOR NAME OF INVENTOR NAME OF INVENTOR  
  
Signature of Inventor Signature of Inventor Signature of Inventor  
13 Aug 1998  
Date Date Date